

I claim:

1. A device for the noninvasive measurement of a patient's blood pressure, comprising:

at least one sensor to be placed on a thoracic wall of a patient, said sensor being responsive to acoustic signals generated by the closing of the patient's cardiac valves and transmitted through the thorax, and producing an electronic phonocardiographic signal corresponding to said detected acoustic signals;

discriminating means for identifying and extracting from the phonocardiographic signal a vibratory profile related to a second cardiac noise periodically produced at the end of the systole, and

means for analyzing at least one predetermined parameter of the vibratory profile and, in response, delivering according to said at least one parameter, a phono-arterial index value representative of the patient's blood pressure.

2. The device of claim 1, further comprising a memory and means for recording the phonocardiographic signal in said memory, wherein the discriminating means and the analyzing means further comprise means for processing the recorded phonocardiographic signal.

3. The device of claim 2, wherein said at least one parameter is a parameter selected from among the group consisting of an extrema of the phonocardiographic signal for a duration of the vibratory profile, an energy of the phonocardiographic signal, a variation

of a derivative of the phonocardiographic signal, a surface of the phonocardiographic signal, and a combination of the forgoing.

4. The device of claim 2, wherein the analyzing means further comprises means for applying a weighted value to said at least one parameter, said weighted value being variable from one vibratory profile to another.

5. The device of claim 4, wherein:

the discriminating means further comprises means for identifying and extracting from the phonocardiographic signal a second vibratory profile related to a cardiac noise periodically produced at a beginning of systole, and

the analyzing means further comprises means for analyzing at least one predetermined parameter of said second vibratory profile, and producing a weighted value that is a function of said at least one predetermined parameter.

6. The device of claim 2, wherein said at least one sensor further comprises at least a first sensor and a second sensor, and means for combining the phonocardiographic signals delivered by said at least first and second sensors into a combined signal, wherein said phonocardiographic signal of said discriminating mean comprises said combined signal.

7. The device of claim 2, further comprising means for evaluating a body position of the patient, and means for determining and memorizing a plurality of average levels of the phonocardiographic signal according to a corresponding plurality of body positions,

wherein the analyzing means further comprises means for identifying a body position of the patient corresponding to the detected vibratory profile, and means for applying to said at least one parameter a weighted value that is a function of the average level memorized for the body position corresponding to the identified body position at the moment of the analysis.

8. The device of claim 2, further comprising means for low-pass filtering the determined phono-arterial index.

9. The device of claim 8, further comprising means for evaluating a respiratory frequency of said patient, wherein said means for low-pass filtering further comprises means for adaptive filtering at a variable cut-off frequency, and means for adjusting said variable cut-off frequency according to the respiratory frequency at the time of the analysis.

10. The device of claim 1, further comprising means for analyzing a respiratory cycle, and means for filtering the phono-arterial index, wherein said filtering means further comprises means for dynamic filtering at a variable gain and means for selecting the gain according to the phase of the respiratory cycle at the time of the analysis.

11. The device of claim 1, further comprising a second means for measuring blood pressure, having an output corresponding to an absolute value of said blood pressure, and means for operating said second blood pressure measurement means in response to the delivered phono-arterial index.

12. The device of claim 1, further comprising means for controlling a measuring and analyzing device of an electrocardiographic signal in response to the delivered phono-arterial index.

13. The device of claim 1, further comprising means for controlling a device for implementation of a therapy in response to the delivered phono-arterial index.

14. The device of claim 1, wherein said at least one parameter is a parameter selected from among the group consisting of an extrema of the phonocardiographic signal for a duration of the vibratory profile, an energy of the phonocardiographic signal, a variation of a derivative of the phonocardiographic signal, a surface of the phonocardiographic signal, and a combination of the forgoing.

15. The device of claim 1, wherein the analyzing means further comprises means for applying a weighted value to said at least one parameter, said weighted value being variable from one vibratory profile to another.

16. The device of claim 15, wherein:

the discriminating means further comprises means for identifying and extracting from the phonocardiographic signal a second vibratory profile related to a cardiac noise periodically produced at a beginning of systole, and

the analyzing means further comprises means for analyzing at least one predetermined parameter of said second vibratory profile, and producing a weighted value that is a function of said at least one predetermined parameter.

17. The device of claim 1, wherein said at least one sensor further comprises at least a first sensor and a second sensor, and means for combining the phonocardiographic signals delivered by said at least first and second sensors into a combined signal, wherein said phonocardiographic signal of said discriminating mean comprises said combined signal.

18. The device of claim 1, further comprising means for evaluating a body position of the patient, and means for determining and memorizing a plurality of average levels of the phonocardiographic signal according to a corresponding plurality of body positions, wherein the analyzing means further comprises means for identifying a body position of the patient corresponding to the detected vibratory profile, and means for applying to said at least one parameter a weighted value that is a function of the average level memorized for the body position corresponding to the identified body position at the moment of the analysis.

19. The device of claim 1, further comprising means for low-pass filtering the determined phono-arterial index.

20. The device of claim 19, further comprising means for evaluating a respiratory frequency of said patient, wherein said means for low-pass filtering further comprises means for adaptive filtering at a variable cut-off frequency, and means for adjusting said variable cut-off frequency according to the respiratory frequency at the time of the analysis.